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CONDUCTION AND INFILTRATION ANESTHESIA

BY
MENDEL NEVIN, D. D. S.

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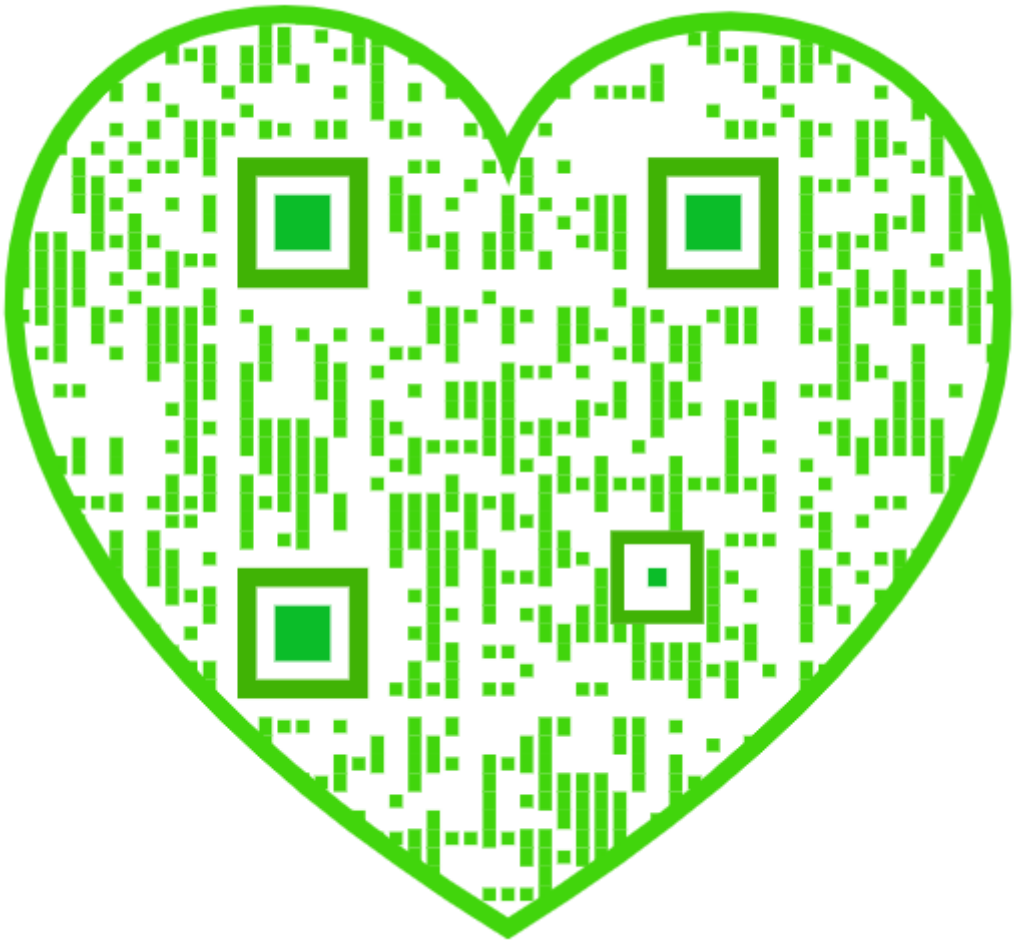

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CONDUCTION
AND
INFILTRATION
ANESTHESIA

WITH

Novocol

PROCAINE TABLETS

BY
MENDEL NEVIN, D.D.S.

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EDITION

PUBLISHED BY
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BROOKLYN, N. Y.

FOREWORD

The object of this booklet is to outline in a concise and explicit manner the modus operandi of different injections in conduction and infiltration anesthesia and also to give a few helpful hints as to the preparation of the solution and sterilization of the different instrumentarium employed.

The average practitioner is often puzzled by the mass of literature and books written on the subject, and the different technique advocated by the various writers. It is therefore our aim to select what we consider to be the simplest and most practical methods and present them to the dental profession.

CHAPTER I

ANATOMY

"Confidence born of knowledge" is an essential element in mastering the technique of conduction anesthesia. One must know the structures which the operator's needle may encounter and the different nerves which he intends to anesthetize. A few hours spent in reviewing the osteology, muscles, blood and nerve supply of the head and neck will not only prepare the practitioner for nerve blocking, but will also be to him a great source of pleasure and gratification in knowing the structures of the field of his daily work.

It is regrettable that space will not permit us to enter into a detailed description of all the important anatomical structures, but of necessity we must confine ourselves only to the nerve supply of the maxilla, mandible, and the teeth.

TRIFACIAL NERVE

The Trifacial (fifth cranial) nerve is a compound nerve—being the sensory nerve of the head and face and motor nerve of the muscles of mastication.

The branches of the Trifacial nerve are:

1. Ophthalmic—the sensory nerve of the eyeball and surrounding structures.
2. Superior Maxillary Nerve—supplying with sensation the upper jaw, gums, teeth, hard and soft palate, lower eyelids, upper lip, and muscles of the nose.
3. Inferior Maxillary Nerve—consisting of a sensory and a motor root. The sensory root supplies with sensation the mandible, tongue, lower gums, teeth, and lip, while the motor root supplies the muscles of mastication.

We will consider here only the second and third divisions of the Trifacial nerve.

THE SUPERIOR MAXILLARY DIVISION

The Superior Maxillary nerve leaves the cranium by the foramen rotundum on the greater wing of the sphenoid bone, crosses the spheno-maxillary fossa, and then enters the orbit through the spheno-maxillary fissure. It then runs on the floor of the orbit in the Infra-orbital canal and is known as the Infra-orbital nerve. It emerges on the face from the Infra-orbital foramen. Before entering the Infra-orbital canal it gives off the Posterior Superior Dental branches, which enter the Posterior Superior Dental foramina on the tuberosity

of Zygomatic surface of the Superior Maxillary bone, and supply the three upper molar teeth, the gums and alveolar process on their buccal side. In the Infra-orbital canal the Middle Superior Dental Branch is given off, supplying the bicuspid teeth, and finally just before it emerges from the Infra-orbital foramen, the Anterior Superior Dental Nerve is given off, running in a special canal in the facial surface of the Superior Maxillary bone and supplying the incisor and cuspid teeth, and also the gums and alveolar process and periosteum on their labial side.

On the face three branches are given off—palpebral, nasal, and labial—supplying the lower eyelid, the side of the nose and the upper lip. (Figure 1.)

MECKEL'S GANGLION

In connection with the Superior Maxillary Nerve, we must also consider the Meckel's or Spheno-Palatine Ganglion. We have noted above that the anterior, middle and posterior dental nerves are supplying the pulps of the upper teeth, the gum tissues on the buccal side and the outer alveolar plate. The inner alveolar plate and the gums and mucous membrane on the lingual surfaces as well as the hard and soft palates are supplied by the nerves given off from the Meckel's Ganglion.

Meckel's Ganglion is situated in the Spheno-Maxillary fossa, near the Spheno-Palatine foramen, just below the Superior Maxillary Nerve. This ganglion possesses sensory, motor and sympathetic roots, its sensory roots being derived from the Superior Maxillary Nerve.

Of all of its branches of distribution, we are most vitally interested with the *descending* or *palatine* going to the palate and *internal* to the nose. (Figures 1 and 2—see pages 5 and 6.)

ANTERIOR, MIDDLE AND POSTERIOR PALATINE NERVES

The descending or palatine branches are three in number—anterior, middle and posterior. The anterior palatine nerve passes through the posterior palatine foramen, which is situated ½ cm. above and posteriorly to the upper first, second or third molar tooth (depending upon the age of the patient) and is formed by the junction of the superior maxillary bone with the horizontal plate of the palate bone. The nerve runs in a groove on the hard palate up to about the canine tooth, supplying the gums, mucous membrane of the hard palate as far as the cuspid tooth. The middle and posterior palatine nerves pass through the accessory and posterior palatine canals respectively and supply the soft palate, tonsils, and uvula.

NASO-PALATINE NERVE

Of the *internal branches* we are mostly interested with the Naso-palatine nerve, which enters the nasal fossa through the naso-palatine foramen, passes to the roof of the nose and then runs obliquely along

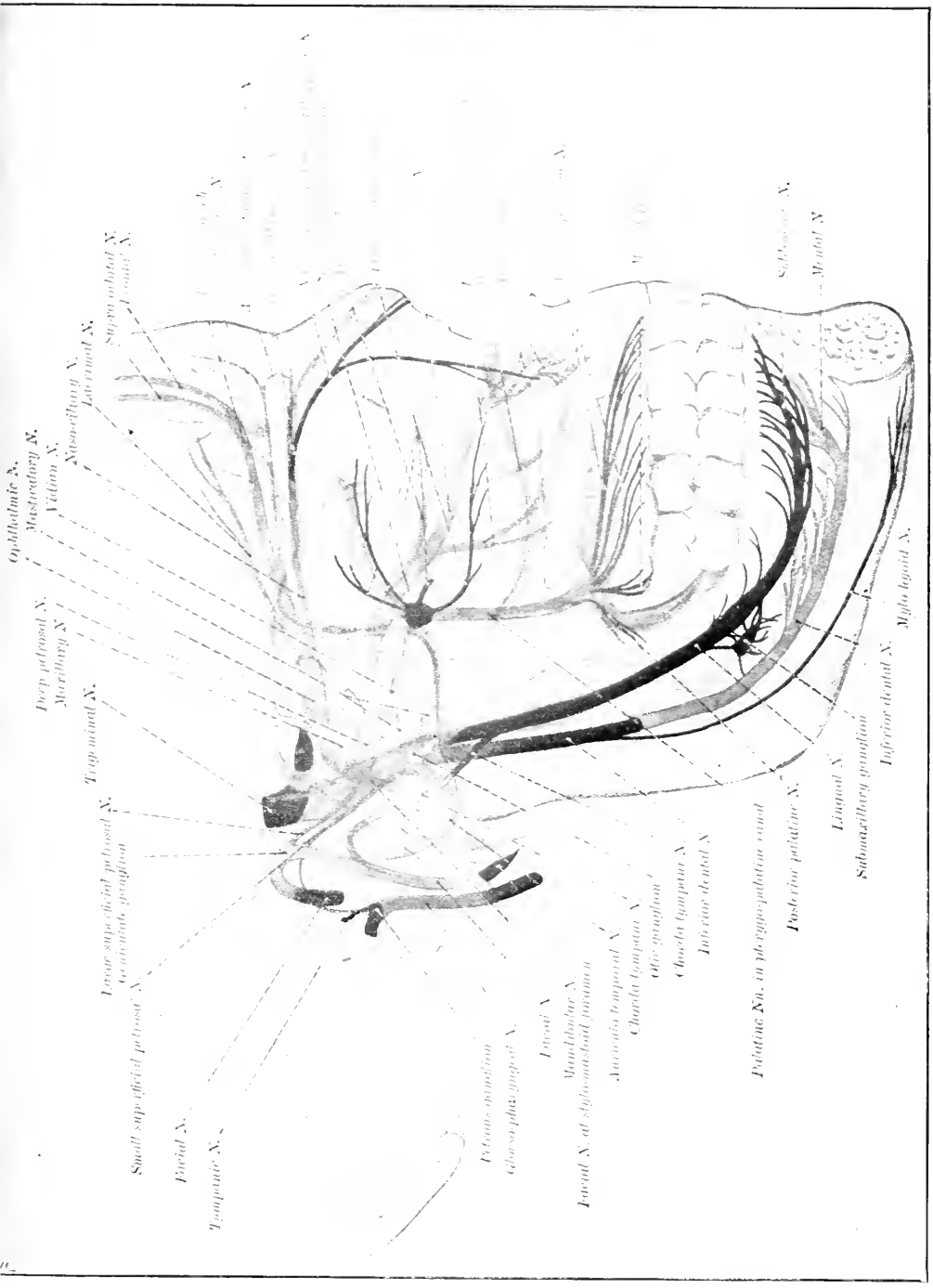

Figure 1

Trifacial Nerve. Light lines are the branches running in bony structures, dark lines in soft tissues. (After Sobotta.)

the septum, being lodged in the naso-palatine canal in the Vomer bone, and finally enters the oral cavity through the anterior palatine (incisor) foramen, supplying the mucous membrane and the hard palate of the incisor and cuspid regions and anastomosing with the anterior palatine nerve on the same side.

INFERIOR MAXILLARY (MANDIBULAR) NERVE

The Inferior Maxillary Nerve (Figure 1—see page 5) is the largest of the three divisions of the fifth nerve and the one which contains its motor root. It leaves the cranium by the foramen ovale on the greater wing of the sphenoid bone and immediately upon its exit divides into two trunks—anterior and posterior.

The anterior trunk is the motor nerve of the muscles of mastication, supplying the following muscles: the masseter, temporal, external pterygoid, and buccinator. The Internal Pterygoid muscle is supplied by a branch of the Inferior Maxillary before its division.

BUCCAL NERVE

It is important for us to note one of the branches—Buccal (or long buccal). This nerve runs along the inner surface of the

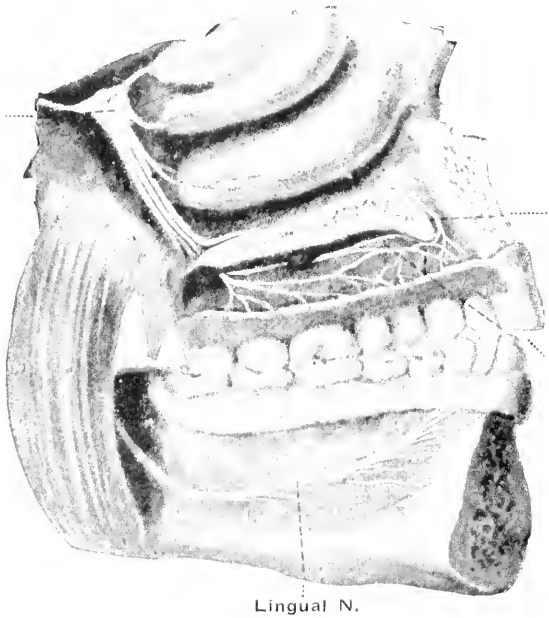

Figure 2

Anastomosis of nasopalatine and anterior palatine nerves. Distribution of lingual nerve in the mandible. (After Bünte and Moral.)

coronoid process of the lower jaw and supplies with sensation the buccinator muscle and the mucous membrane lining its inner surface. The motor supply of this muscle is derived from the facial (seventh) nerve.

The posterior trunk of the inferior maxillary is a sensory nerve, receiving but a few filaments from the motor root. Of its three branches, we will take up the lingual (gustatory) and inferior dental.

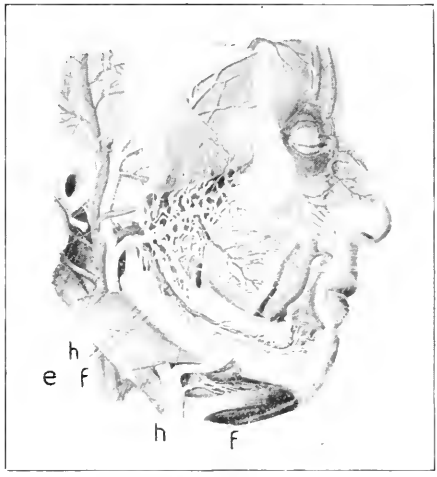

Figure 3

(Sobotta)—(e) lingual nerve; (f) inferior dental nerve; (h) inferior dental artery.

LINGUAL NERVE

The lingual nerve runs for some distance together with the inferior dental. It then passes on the inner side of the ramus to the side of the tongue and supplies the papillae, the anterior two-thirds of the tongue and also the lingual mucous membrane and periosteum of the lower teeth.

INFERIOR DENTAL NERVE

The Inferior Dental Nerve (Figures 3, 4 and 18—see pages 7, 8 and 18) passes with the inferior dental artery to the inferior dental foramen. The nerve runs at first beneath the External Pterygoid muscle and then between the ramus of the mandible and the internal lateral ligament. Having entered the inferior dental foramen, it runs forward in the inferior dental canal beneath the lower teeth. At the mental foramen it divides into two branches—mental and incisor. From the inferior dental and incisor nerves dental branches are given off to supply the pulps of the lower teeth.

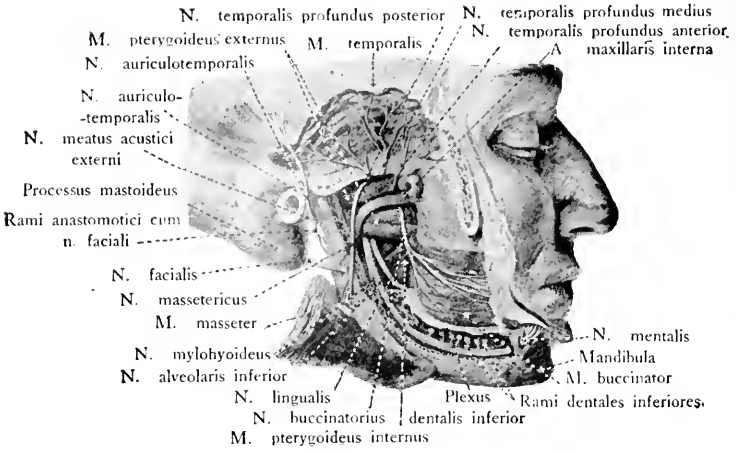

Figure 4

(Spalteholz)

MENTAL NERVE

The mental branch emerging from the mental foramen anastomoses with its fellow on the opposite side, supplying the chin, lower lip, and mucous membrane (Figure 4).

Note (Figure 5) the relation of the inferior maxillary nerve to the inferior maxillary artery, which is situated posteriorly and externally to the nerve.

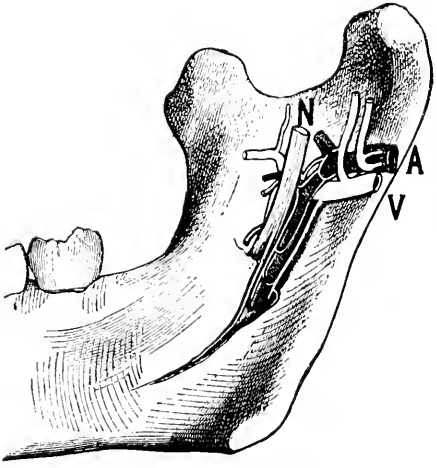

Figure 5

Relation of nerve and vessels in the pterygo-mandibular space. (Zuckerkandl.)

CHAPTER II

STERILIZATION AND PREPARATION OF THE SOLUTION

An extraction may be considered successful when the operation is painlessly performed and it is not followed by any post operative complications. One of the most frequent causes of after pain is infection.

An extraction, being a surgical operation, should be treated as such, and no time or pains should be spared in maintaining strict asepsis during the operation. It is true that the oral cavity is less susceptible to infection than some other parts of the body. Nevertheless, there are a number of cases on record where severe infections and even death followed the extraction of a tooth. It is therefore imperative that all possible precautions be exercised in the sterilization of the needles, syringes and the preparation of the injecting solution.

ISOTONIC SOLUTIONS

One of the first principles we must bear in mind is that the anesthetic solution, when injected, must not cause any disturbances in the tissue cells. For this reason we must use only isotonic solutions, i. e., solutions which have the same density or salt constituents as the cell contents. The living cell is surrounded by a semipermeable membrane. This membrane will permit only the diffusion of water, but not salt ingredients. If, therefore, the injected fluid is *hypertonic* —richer in salt constituents than the cell contents—the water from the cell will escape into the injected solution, and the cell will shrink. If, however, the injected fluid is deficient in salt constituents, or *hypotonic,* the reverse will take place, namely, the water will penetrate into the cell walls and the cell will swell. In either case death of the living cells will ensue, causing sloughing and pain.

RINGER SOLUTION

An isotonic solution is best prepared by dissolving three Ringer Tablets to an ounce of distilled water. The constituents of Ringer Tablets are as follows:

Sodium Chloride	0.05 gram.
Calcium Chloride	0.004 gram.
Potassium Chloride	0.002 gram.

Clinical tests have proven the value of the addition of small quantities of calcium and potassium salts, both of which are essential

ingredients of the blood plasma and the cell contents. The addition of minute quantities of calcium increases the vital function of the leucocytes, thereby also increasing the resistance to infection.

100 RINGER TABLETS
Directions:- To obtain the Ringer Solution, dissolve 3 Ringer Tablets to 1 oz. (30 C.C.) of distilled water.
Novocol Chemical Mfg. Co.
BROOKLYN, N.Y.

Figure 6

Ringer Tablets.

RINGER FLASK

The Ringer stock solution should be kept in a Novol Ringer Flask (Figure 7), especially constructed to protect the solution from contamination from dust and other foreign particles. It is provided with a ground-glass stopper, having a small perforation. When the Ringer solution is needed the glass stopper is merely loosened, not removed, to admit a very small amount of air necessary for the expulsion of the liquid. The air may also be filtered by the insertion of sterile cotton in the glass stopper over the perforation.

Figure 7

Novol Ringer Flask.

PREPARING THE SOLUTION

When the patient is ready for an extraction, about 2½ cc. of the Ringer stock solution is poured into a Novol Porcelain Dissolver (Figure 8), and then boiled over an alcohol lamp (Figure 9), after which two Novol Procaine-Suprarenal Extract Tablets No. 1 (Dental) are added.

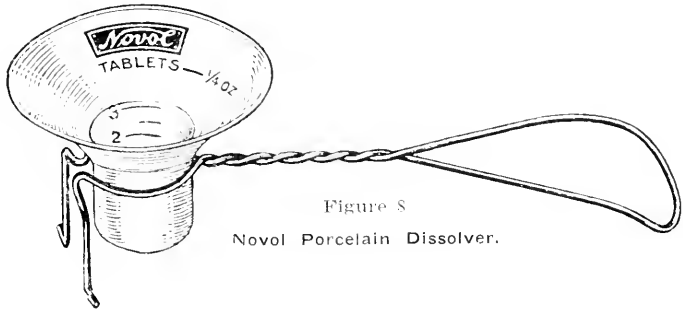

Figure 8
Novol Porcelain Dissolver.

The solution is then again brought to the boiling point for but a few moments. Prolonged boiling after the Novol Procaine-Suprarenal Extract Tablets have been added should be avoided on account of the possibility of injury to the chemical composition of the Suprarenal Extract.

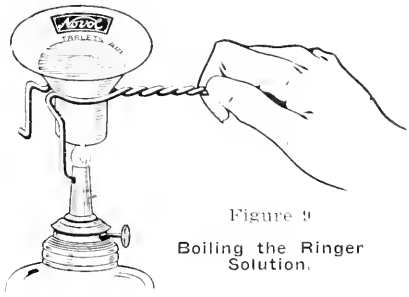

Figure 9
Boiling the Ringer Solution.

During the process of manufacture the Novol Procaine Tablets are not touched by human hands. To safeguard them from contamination, it is also important that they are not handled with the fingers by the operator. Sterile pliers may be used for this purpose. A still better method is to gently turn the tube until the required number of tablets drop into the dissolving cup. A little practice will enable the operator to do this without difficulty.

The unused portion of the solution should be covered with the glass cover provided with the Novol Porcelain Dissolver to protect it from contamination (Figure 10).

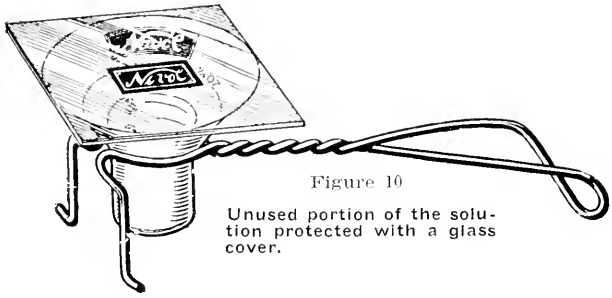

Figure 10

Unused portion of the solution protected with a glass cover.

The solution is now drawn up into the syringe through the hypodermic needle, previously sterilized. By this time the solution will be reduced to the body temperature, which is the most suitable for injection.

PERCENTAGE SOLUTIONS

The Novol Procaine-Suprarenal Extract Tablets No. 1 (Dental) contain each

Procaine ..... 0.02 gram
Suprarenal Extract .....0.000045 gram

so that by dissolving two of these tablets in the manner indicated an approximately 2% Procaine solution and 0.000045 gram Suprarenal Extract to 1 cc. will be obtained.

We advocate 2½ cc. to allow for evaporation in boiling, and also to be assured of a syringeful (2 cc.), the average quantity necessary for an extraction.

If a smaller percentage of Suprarenal Extract is desired, Novol Procaine Tablets No. 2 should be used instead, as they have about half the amount of Suprarenal Extract. These tablets contain each

Procaine ..... 0.02 gram
Suprarenal Extract .....0.00002 gram

and when dissolved in 2 cc. Ringer solution will yield a 2% Procaine solution and 0.00002 gram Suprarenal Extract to each cc.

Novol Procaine Tablets No. 4 have no Suprarenal Extract, but only 0.05 gram Procaine.

Some operators prefer to combine one Novol Tablet No. 1 with one Novol Tablet No. 4 in 3½ cc. Ringer solution, obtaining a 2% Procaine solution and Suprarenal Extract 0.000015 gram to each cc.

CHAPTER III

CARE OF SYRINGES AND NEEDLES

The care of the syringes and needles is just as essential as the preparation of the solution.

NOVOL PERFECTO SYRINGE

The selection of the proper syringe has always been the concern of the dental surgeon. An ideal syringe must be non-leakable and washerless. The particles of the felt washers not only clog the lumen of the needles, but may sometimes cause serious complications when

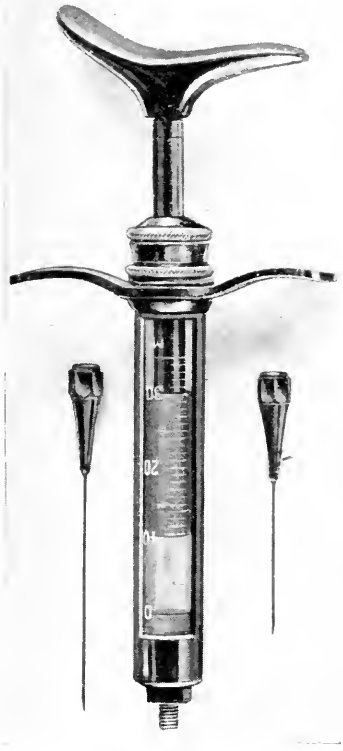

Figure 11

Novol Perfecto Syringe.

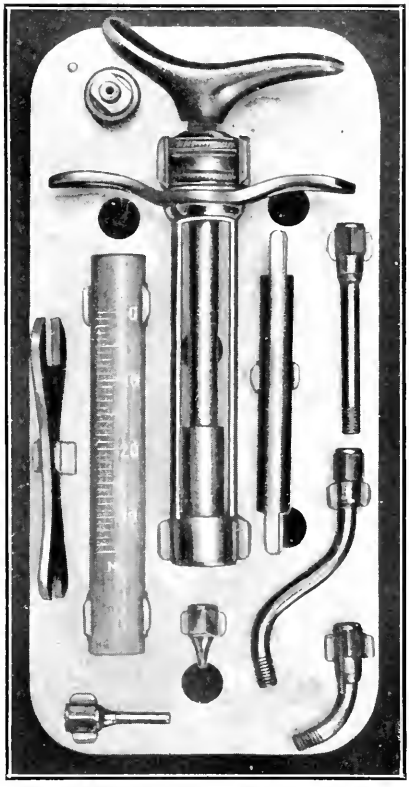

Figure 12

Parts of Novol Perfecto Syringe adjusted on metal plate.

injected into the tissue. The syringe must also not be too cumbersome, and at the same time should be easily taken apart for cleaning and sterilization.

All these features have been taken into consideration in constructing the Novol Perfecto Syringe (Figure 11—see page 13).

The Novol Perfecto Syringe is especially constructed for the dental surgeon. It is devoid of washers and built of glass and metal only. The metal plunger and end plug fit accurately and snugly to the ground-glass barrel. It holds 35 minims (a little over 2 cc.) and is tested to about 250 pounds continuous pressure, so that it may be used efficaciously without regurgitation of the fluid, in conduction as well as in infiltration anesthesia, an important feature to the dental surgeon. It is easily taken apart for sterilization purposes, as shown on the illustration.

A word of warning is here perhaps necessary. In sterilizing the Novol Perfecto Syringe it should never be boiled or very hot water drawn into it, unless it is taken apart, as otherwise the different degrees of expansion of the glass and metal under the influence of heat may cause the glass barrel to break.

All the parts of the Novol Perfecto Syringe, together with the needles, are adjusted on a metal plate (Figure 12—see page 13), so that they may all be submerged and removed at one time from the sterilizer.

The metal box, in which the Novol Syringe together with all the attachments and needles are packed, may be very conveniently used at the same time as a sterilizer, as shown in illustration (Figure 11—see page 13).

All the parts of the Novol syringe, as well as the attachments and hypodermic needles, are adjusted on the metal plate and submerged into the metal case, half filled with water. The case is then placed on the stand (Figure 13—see page 15), and the water brought to boiling by either a bunsen burner flame or the small can of solidified alcohol.

The syringe should be thoroughly cleaned and sterilized every morning, and then submerged into a solution containing 70% alcohol and 30% glycerine.

If steel needles are used they should be sterilized by boiling before each extraction.

Platinum-irridium needles may be sterilized by subjecting them to an alcohol or gas flame.

Only two size needles are necessary in conduction anesthesia—the 42 mm. (1⅝″) and 25 mm. (1″) with the hubs attached or else mounted on the long or short hub (Schimmel type).

Needles should be dried after each case by drawing through them absolute alcohol and blowing out with a hot-air syringe, after which a thin wire is introduced into their lumen.

It is a good policy to discard steel needles after they have been used a number of times, as prolonged use may cause them to rust and break.

Before using the syringe or needles all traces of alcohol should be removed by drawing warm water through the syringe several times. The injection of alcohol is very irritating and may also cause undue prolongation of the anesthesia.

DISINFECTION OF THE FIELD OF OPERATION

One missing link in the cycle of all the antiseptic precautions necessary to successful local injection is often sufficient to cause post-operative complications, such as edema, pain, and sloughing. The disinfection of the field of operation is just as important as the sterilization of the instruments and the preparation of the solution.

Tincture of iodine and tincture of aconite, equal parts, have been found to be ideal in the sterilization of the mucosa in surgery, and are especially advantageous around the oral cavity. The point of injection is painted with the aconite and iodine solution. The iodine has a deep penetrating power, hardening the mucosa and preventing the bacteria from penetrating into the puncture. The combination at the same time acts as an analgesic, counteracting the slight pain caused by the insertion of the needle into the mucous membrane.

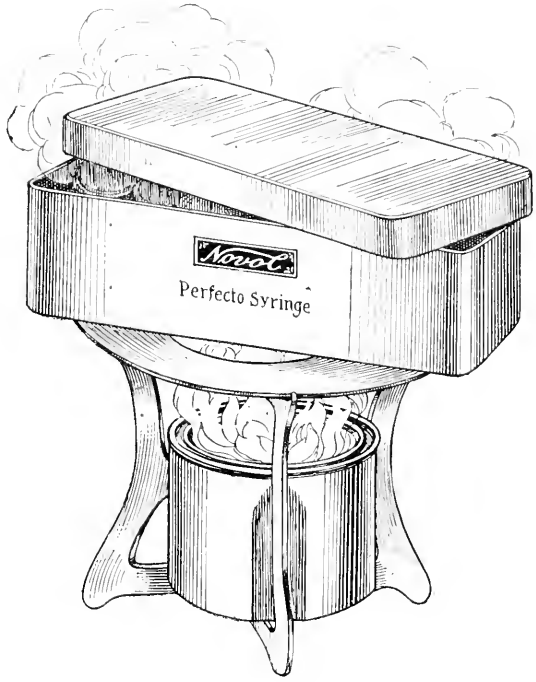

Figure 13

Novol Perfecto Syringe in metal box in process of sterilization.

CHAPTER IV

CONDUCTION ANESTHESIA

The most important and perhaps most difficult of all the injections in nerve blocking is the *mandibular.*

Every dental practitioner who has attempted to anesthetize a lower molar tooth with an ordinary subperiosteal injection knows the great difficulties attending this procedure. The reason is quite obvious. A glance at the mandible will show us the great density and thickness of the alveolar plates in that region, so that diffusion of the anesthetic solution into the alveolus is very difficult and sometimes impossible. But with one mandibular injection, however, it is possible to anesthetize not only the molars, but almost all the teeth to the median line on that side.

The results then obtained by this injection will more than repay the time and patience expended in mastering its technique.

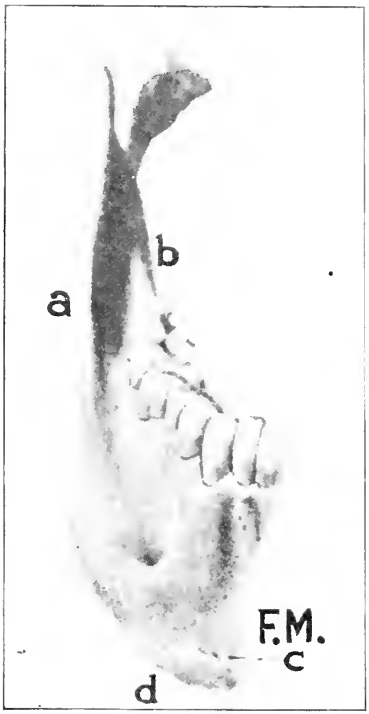

Figure 14

(a) External oblique line; (b) Internal oblique line. (Bünte and Moral.)

MANDIBULAR INJECTION

Besides the nerve supply of the mandible which we have described on the first few pages of this booklet, we must also consider other ana-

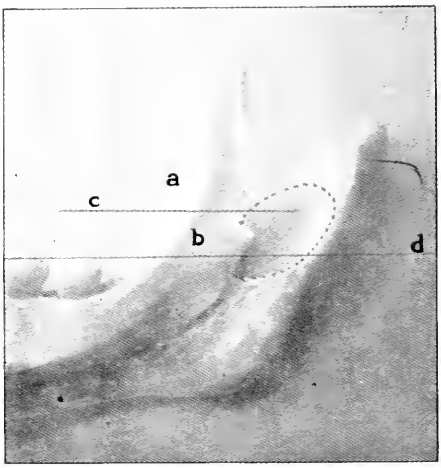

Figure 15

(a) External oblique line; (b) Internal oblique line; (c) position of the needle; (d) occlusal plane; the punctuated line forms the boundary of the mandibular sulcus. (Seidel.)

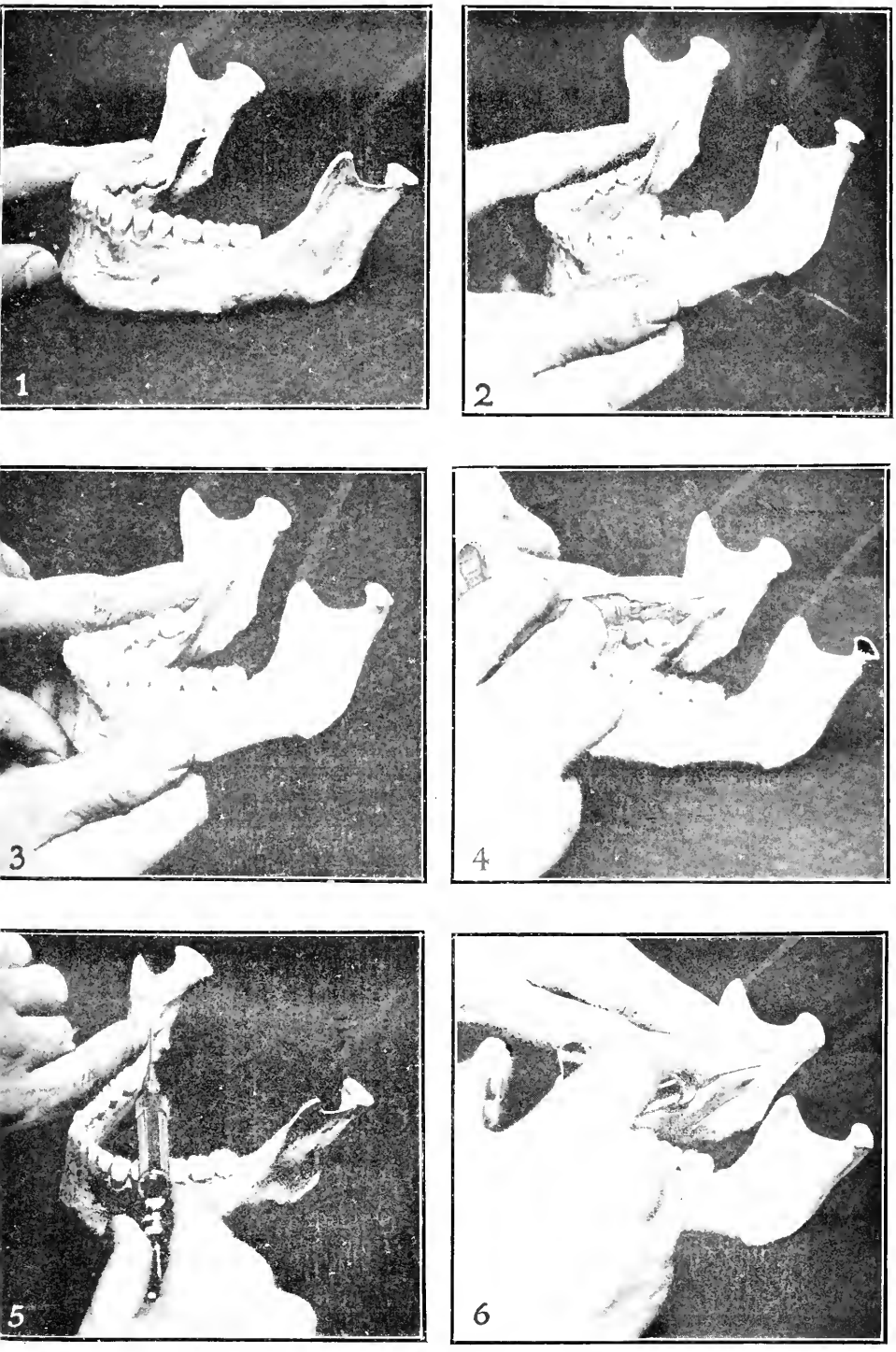

Figure 16

(1) Palpating External oblique line; (2) Palpating Retromolar fossa; (3) Palpating Internal oblique line; (4) Insertion of the needle and injecting for the lingual nerve; (5) Placing the syringe between the two bicuspids on the opposite side; (6) Injection into the mandibular sulcus.

tomical structures of the lower maxilla in order to master the landmarks for this injection.

Figure 14—see page 16—shows distinctly on the external surface of the mandible a ridge running at first horizontally, but then inclining upward and continuing with the anterior border of the ascending ramus. This ridge is known as the external oblique line. On the internal surface (Figure 15—see page 16) we have the mylo-hyoid ridge or the internal oblique line, which is not quite as distinct, but being especially prominent in the region of the molar teeth. These two ridges, with the last molar as the base, form the *retromolar* triangle, while the groove within this triangle is known as the *retromolar* fossa.

On the internal surface of the ascending ramus we note in the center the *Inferior Dental Canal*, protected anteriorly by a spicule of bone—the lingula, which gives attachment to the internal lateral ligament. Below is a rough surface for the attachment of the Internal Pterygoid muscle (Figure 15—see page 16), while the coronoid and condyloid processes give attachments to the Temporal and External Pterygoid muscles respectively. The space between these muscles is devoid of any muscle attachment and is called the *pterygo-mandibular* space. Posteriorly to the mandibular foramen is a depression known as *sulcus mandibularis*, where the mandibular injection is made.

The technique of this injection is as follows:

On the right side. Place your left index finger in the patient's mouth, buccally to the lower teeth, pushing the cheek outward, and moving the finger upward, until you strike the external oblique line (Figure 16-1—see page 17). Now place the palm of your finger over the occlusal surface of the

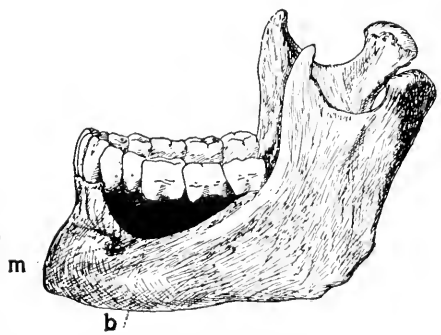

Figure 17

(b) Area supplied by Long Buccal Nerve; (m) mental foramen. (Fischer.)

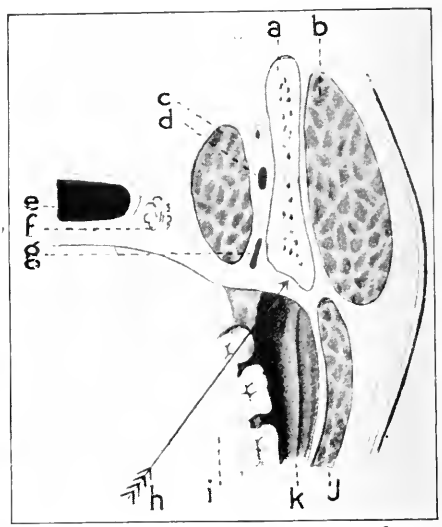

Figure 18

Cross section through the ascending ramus of the jaw parallel to the biting surface of the teeth of the lower jaw. (a) Mandible; (b) masseter muscle; (c) internal pterygoid muscle; (d) inferior dental nerve; (e) pharynx; (f) tonsil; (g) lingual nerve; (h) position of needle; (i) floor of the mouth; (k) vestibulum oris; (j) buccinator muscle. (Braun.)

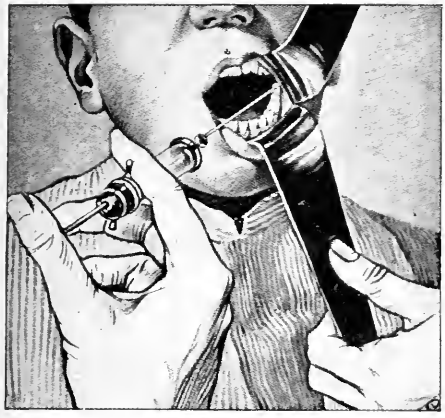

Figure 19

Injection at the lingula, showing the position of the syringe. (Braun.)

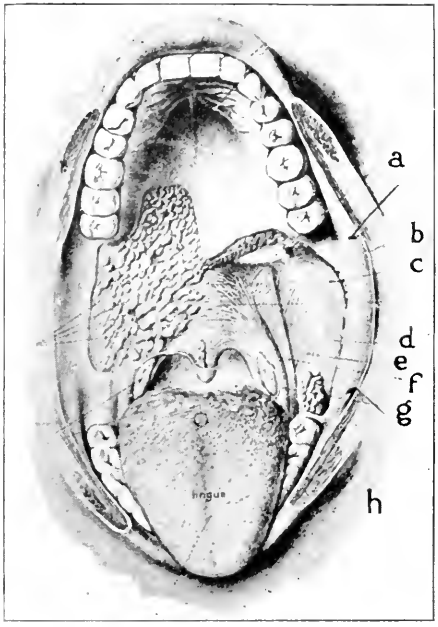

Figure 20

(a) Tendo, musc. tensoris veli palatini; (b) bucca; (c) musc. buccinatorius; (d) raphe pterygo-mandibularis; (e) musc. cephalo-pharyngeus; (f) musc. pharyngo-palatinus; (g) musc. glosso-palatinus; (h) glandulae molares. (Sobotta.)

lower teeth and find with the ball of your finger the depression posteriorly and externally to the last molar—the retromolar fossa (Figure 16-2—see page 17). Next turn the palm of your finger outwardly and with your finger nail palpate the internal oblique line, resting the radial side of your index finger on the occlusal surfaces of the teeth (Figure 16-3—see page 17). Now, moving the finger nail slightly outwardly to expose the internal oblique line, the area is painted with aconite and iodine. The syringe is held in the right hand in a penlike manner and the needle is inserted into the soft tissues covering the internal oblique line, using the center of the finger nail as a guide, or 1 cm. above the occlusal surfaces of the lower teeth (Figure 16-4—see page 17). Push the needle slightly inward, holding the syringe parallel with the body of the mandible and inject about three drops to anesthetize the lingual nerve, which, as we have stated, supplies the lingual mucous membrane and periosteum of the lower alveolar process. The syringe is then placed on the opposite side between the two bicuspid teeth or between the canine and first bicuspid, depending upon the angle formed by the ascending ramus (Figure 16-5—see page 17) and the needle is slowly advanced posteriorly, keeping all the time in contact with the internal surface of the ascending ramus, until about one inch of the needle has disappeared, when the contents of the syringe are slowly injected (Figure 16-6—see page 17). If the proper technique is carried out the solution will be deposited in the upper part of the mandibular sulcus. Complete anesthesia to almost the lateral incisor will follow in from ten to twenty minutes.

The same technique is carried out on the left side, with the one exception that the right index finger is used in palpating, while the syringe is held with the left hand. Some operators, however, prefer, while injecting on the left side, to use the left index finger as a guide, injecting at the same time with the right hand.

The anesthesia will manifest itself by a peculiar sensation on the median line of the lower lip or in the cuspid region. The patient will also complain of a numbness of the tongue and lower jaw. It is always desirable to test the mucous membrane of the tooth to be

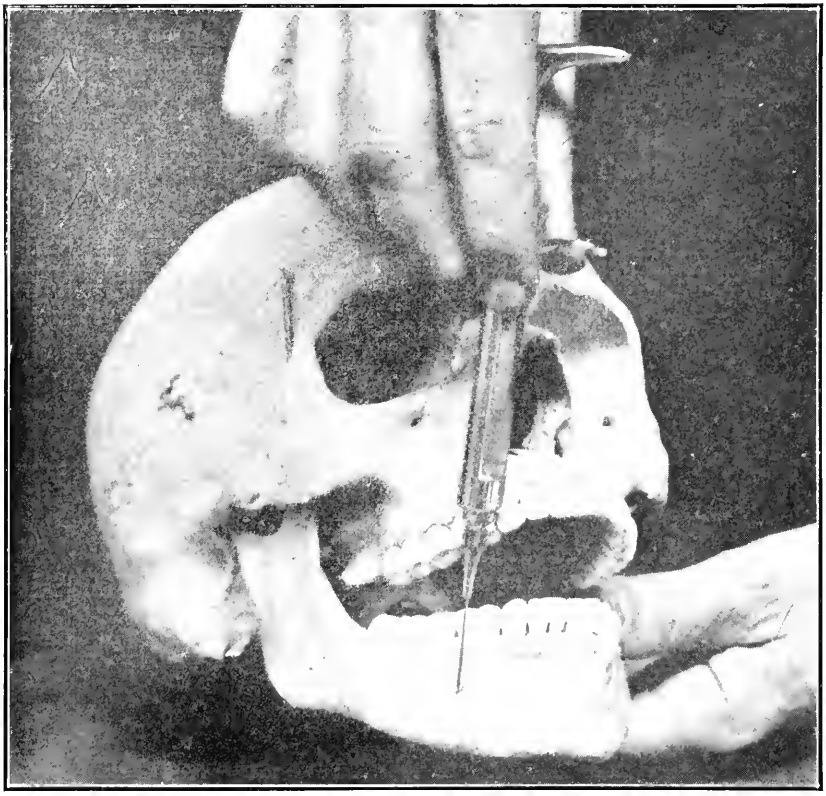

Figure 21

Mental Injection.

extracted, both lingually and buccally, by compressing the gingiva with a pair of sterile pliers or sharp instrument. In a number of cases there will be sensation only in the buccal side, indicating that the long buccal nerve which supplies the Buccinator muscle with sensation must be anesthetized separately. This is easily accomplished by infiltrating with about 0.5 cc. of the solution the buccal mucous membrane of the tooth to be extracted. In infected cases the adjoining healthy parts of the Buccinator muscle may be anesthetized with good effect (Figure 17—see page 18).

MENTAL INJECTION

By a mental injection we may anesthetize the bicuspids, cuspid, and sometimes the lateral incisor. If a mandibular injection has been given and an operation on the two incisors and cuspid teeth is contemplated, it is also necessary to give an opposite mental injection, desensitizing the anastomosing filaments from the opposite mental nerve.

The technique is as follows:

Palpate with the index finger the mental foramen, which is generally situated below and between the two bicuspid teeth. Retracting

Figure 22

Tuberosity Injection.

the lip with the thumb, insert the needle into the mucous fold, between the two bicuspid teeth, and proceed downward and slightly backward, injecting slowly until the injecting fluid is felt by the palpating finger. Inject about 1.5 cc. (Figure 21.)

Since mandibular injections give such perfect results, mental anesthesia is seldom indicated. One mandibular injection will anesthetize all the molars, bicuspids, and sometimes the cuspid on that side; while two mandibular injections—one on either side—will anesthetize the entire lower arch.

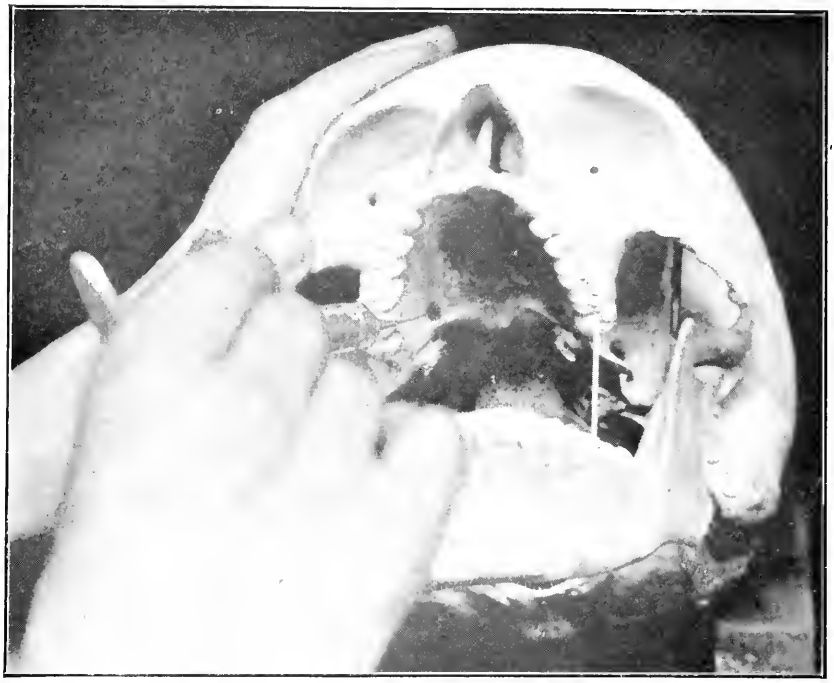

Figure 23

Posterior Palatine Injection.

TUBEROSITY INJECTION

It is unfortunate that up to the present time a method has not as yet been devised where by one or two injections all the teeth of the Superior Maxilla on either side could be anesthetized similarly to the mandibular injection. Some research workers advocate various methods of blocking the Superior Maxillary Nerve in toto, but only with partial success. We shall speak of these later. The author himself is at present engaged in experimentation with some of these injections, but his conclusions as to their absolute safety and efficacy are not as yet final, nor do his clinical data so far warrant advocating their adoption.

The upper three molar teeth are supplied by the posterior superior dental nerves, branches of the Superior Maxillary, given off in the Spheno-Maxillary fossa and entering the Zygomatic surface of the Superior Maxillary bone at the posterior superior dental canals.

To anesthetize the upper molars, insert the needle into the reflection of the mucous membrane of the distal third of the second molar, having previously instructed the patient to partly close his mouth, in order to avoid the coronoid process of the ramus. Proceed then with the needle at an angle of about 45 degrees, in the direction of the root apex of the third molar, slowly injecting all the time, until about

2 cm. (1″) of the needle has disappeared, when the contents of the syringe are deposited (about 2 cc.). In cases where the third and second molars have not as yet erupted the tooth preceding the last one is always used as a guide. Anesthesia occurs from five to ten minutes, lasting an hour or longer (Figure 22—see page 21).

The mucous membrane and alveolar process on the palatal side of the upper molars are innervated by the anterior palatine nerve, passing through the posterior palatine foramen, and it is therefore necessary to anesthetize this branch in case an extraction or operation involving these structures is contemplated. The zygomatic injection alone will suffice in cavity preparation and extirpation of pulps.

POSTERIOR PALATINE INJECTION

The needle is inserted into the mucous membrane on the palatine side posteriorly to the second molar (or first or second, depending upon the age of the patient) ½ cm. above the gum margin and advanced parallel with the alveolus in a backward direction toward

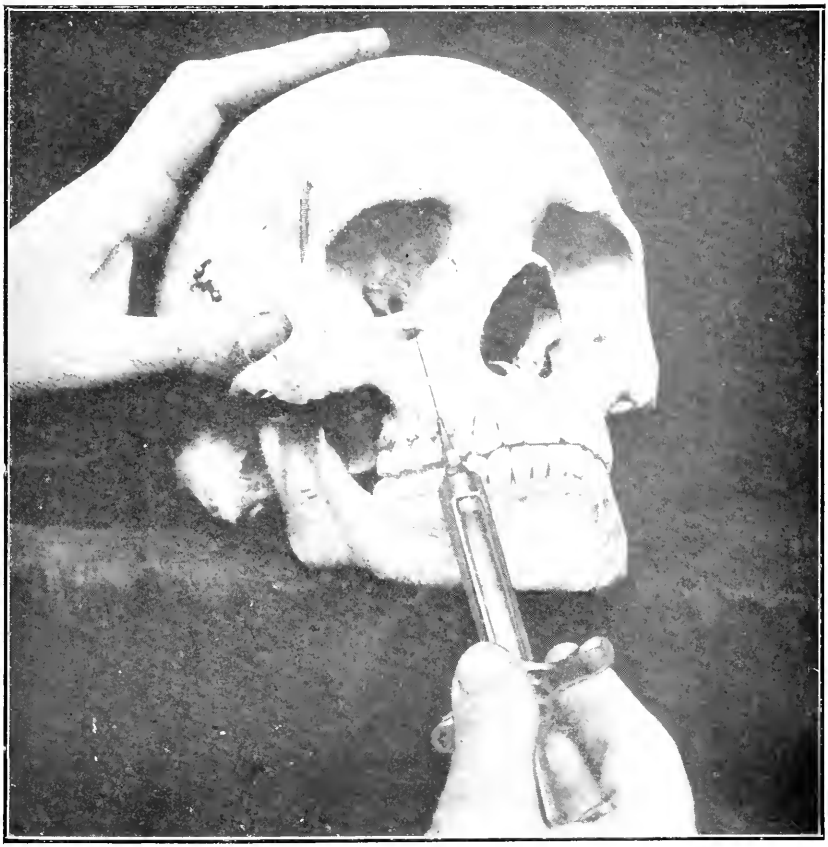

Figure 24

Infra-orbital Injection.

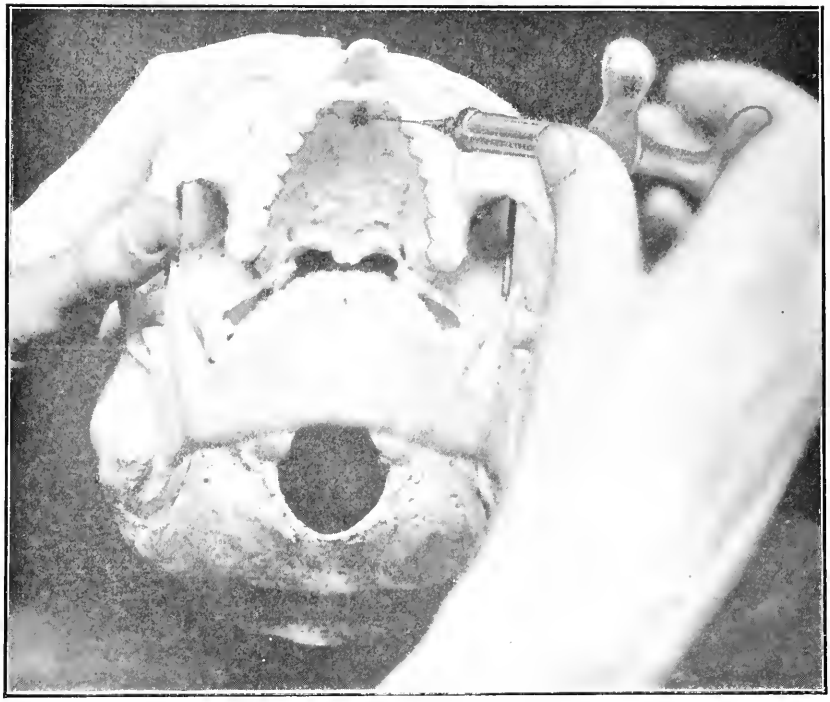

Figure 25

Anterior Palatine Injection.

the apex of the third molar until the foramen is reached, where about 10 minims of the solution are injected. Anesthesia on the palatal side of the molars and bicuspids will follow almost immediately (Figure 23—see page 22).

Care should be taken not to direct the needle too far posteriorly, as the middle and posterior palatine nerves, which supply the soft palate and the uvula and which pass through the accessory palatine canals, may also be anesthetized, causing the patient a disagreeable gagging sensation.

INFRA-ORBITAL INJECTION

The central and lateral incisors and cuspid teeth are innervated by the anterior superior dental nerve, which is given off the Infra-orbital nerve just before it emerges from the infra-orbital foramen.

The technique of the injection is as follows:

An imaginary line is drawn passing through the pupil of the patient's eye and the long axis of the second bicuspid tooth. The infra-orbital foramen is then palpated with the tip of the index finger. The foramen will almost invariably be found on this imaginary line about 0.5 cm. below the infra-orbital ridge. With the thumb the lip is retracted and the needle inserted above the apex of the second bicuspid into the mucous fold as high as the reflection of the mucous membrane

will permit. Following the imaginary line toward the infra-orbital foramen, the needle is advanced, keeping it away from the bone, else the concavity of the canine fossa will retard the progress of the needle. The solution is slowly injected while the needle is being advanced until the expulsion of the solution is being felt by the compressing tip of the index finger, when about 1.5 cc. of the solution is deposited. Anesthesia in the central, lateral and cuspid teeth of the side injected will follow in from five to ten minutes (Figure 24—see page 23).

Lingually, however, the mucous membrane, alveolar process and periosteum are supplied by the naso-palatine nerve which emerges from the incisive (anterior palatine) foramen. This nerve should be blocked for an extraction or an operation involving the parts which this nerve innervates.

INCISIVE INJECTION

This may be easily accomplished by inserting the needle lingually into the papillae, between the two upper central incisors, and pushing it upward to the incisive foramen. About five or six drops are sufficient to produce anesthesia of the gum tissue and alveolar process and periosteum on the lingual side. The insertion of the needle for this injection is quite painful on account of the extreme sensitiveness

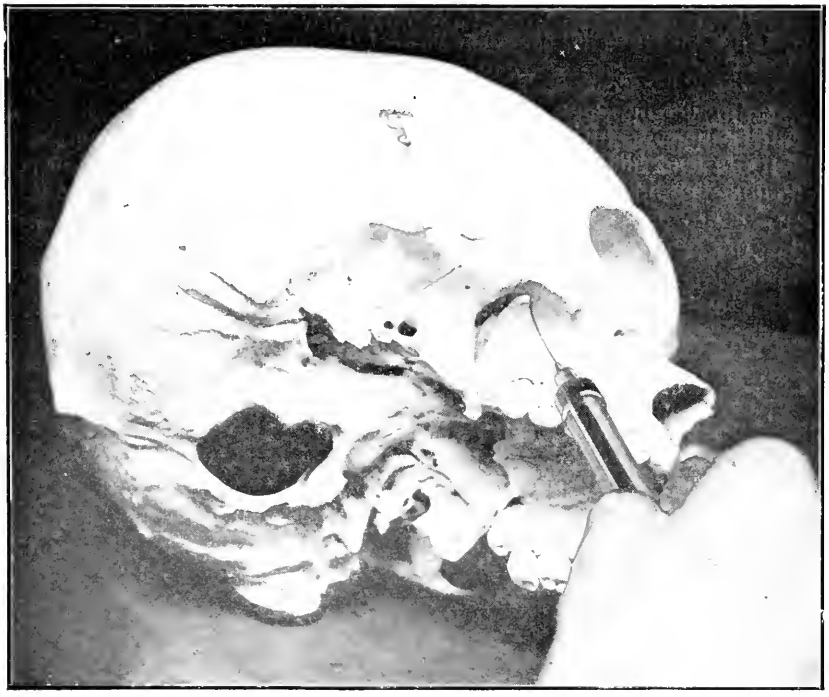

Figure 26

Injection for Bicuspid Anesthesia.

of the papillae. This is easily overcome by inserting the needle laterally to the papillae and then advancing toward the large incisive foramen (Figure 25—see page 24).

NERVE BLOCKING FOR THE BICUSPID TEETH

A tuberosity injection will sometimes anesthetize the second bicuspid or the first bicuspid may sometimes be anesthetized by an infra-orbital injection. On the other hand, it happens quite frequently that a tuberosity injection will fail to completely desensitize the first molar tooth. These phenomena appear to be due to the various methods of innervation of the bicuspid teeth as advocated by different authorities.

Gray describes anastomosis of the middle superior dental branch with the posterior superior dental forming the Ganglion of Valentine and also with the anterior superior dental forming the Ganglion of Bochdaleck, neither of which is probably a true ganglion.

From the above description it is evident why we often fail to obtain anesthesia in the first molar tooth with a tuberosity injection, as sensation is conducted by the anastomosis of the middle superior dental branch.

Other authorities maintain that the middle superior dental branch is given off together with the posterior superior dental and enters the body of the Superior Maxilla through separate canals situated anteriorly to the posterior dental canals, which fact would account for the bicuspid anesthesia we sometimes obtain by a tuberosity injection.

Again this branch (middle superior dental) may be absent altogether, the bicuspid teeth being supplied by the anterior superior dental nerve, or else it may be a part of the anterior superior dental nerve.

From all of these descriptions it is safe to suppose, however, that most frequently the bicuspid teeth derive their nerve supply from the middle superior dental branch, which is given off somewhere in the infra-orbital canal. This accounts for the difficulty in reaching and blocking this nerve with the hypodermic needle.

INJECTION INTO SPHENO-MAXILLARY FOSSA

Dr. Arthur E. Smith advocates an injection into the Spheno-Maxillary fossa. By this injection not only the bicuspids but also the molars and anterior teeth on that side could be anesthetized. The solution will also reach Meckel's Ganglion, since it is located below the Superior Maxillary nerve, thus obviating the necessity of blocking the anterior palatine and naso-palatine nerves.

The needle employed for this injection is 36 mm. long, 24 gauge, which is mounted on a curved attachment with an extension arm. The needle is inserted laterally to the third molar, keeping it in contact with the Zygomatic surface of the Superior Maxillary bone and

moved upward and inward until the entire length of the needle is inserted. About 2½ or 3 cc. are injected, and anesthesia will follow in from five to fifteen minutes.

This injection, if successful, is invaluable in operations involving the Antrum of Highmore, or large areas of bone and also in cases when it becomes necessary to extract a number of teeth or roots at one sitting.

BICUSPID ANESTHESIA

The writer has been lately experimenting with an injection which, in his opinion, promises to be of great value in conduction anesthesia. By this injection the infra-orbital nerve is blocked, just prior to its entrance into the infra-orbital canal.

The examination of the Spheno-Maxillary and Zygomatic fossae (Figure 26—see page 25) and their relation will reveal to us the course of the second division of the Trifacial nerve up to the time when it enters the infra-orbital canal and is then known as the infra-orbital nerve. It will be noted that the infra-orbital nerve passes through the outer third of the Spheno-Maxillary fissure, where it enters the canal. By blocking the nerve at this point we anesthetize not only the posterior superior dental, but the middle superior branch and quite frequently the anterior superior dental nerve.

For this injection a 42 mm. 23 gauge platinum irridium needle is used, curved in the manner illustrated (Figure 26—see page 25). The malar process of the Superior Maxillary bone is at first located and then the needle inserted at the mucous fold above the apex of the second molar tooth, with the concavity of the needle anteriorly. The needle is then advanced, keeping it in contact with the posterior surface of the malar process of the Superior Maxillary bone until the entire length of the needle disappears, when about 2 cc. of the solution is deposited. The writer has found this injection to be successful in about 60% of the cases for obtaining anesthesia in the bicuspids and molar teeth.

The best method of anesthetizing the bicuspid teeth, however, in the absence of infection, is by infiltration.

CHAPTER V

INFILTRATION ANESTHESIA

By infiltration anesthesia we endeavor to anesthetize the peripheral filaments of the Trifacial nerve by injecting the anesthetic either under the mucous membrane or the periosteum above the tooth or teeth we are to operate. The anesthetic solution by infiltrating the cancellous structure of the alveolar process reaches the terminal nerve fibres and anesthetizes them. This method of anesthesia may then be subdivided into *submucous* and *subperiosteal.* To be successful the anesthetic should be injected under the periosteum. This requires considerable pressure on account of the tensity and firmness of this structure.

The same antiseptic precautions should be exercised in infiltration anesthesia as are in nerve blocking.

A 25 mm. (one inch) needle should be employed, platinum-irridium preferably.

The needle is inserted buccally through the periosteum, midway between the gingiva and the apex of the tooth to be extracted, with the orifice of the needle pointing toward the bone. The needle is then moved along the bone, injecting slowly, until the apex of the tooth is reached when about 1.5 cc. of the solution is deposited. The same procedure is repeated on the lingual side, depositing the balance of the solution remaining in the syringe (about 0.5 cc.).

Single teeth may be extracted with one buccal and one palatal injection. Repeated punctures of the mucosa should be avoided.

INFILTRATION ANESTHESIA IN UPPER TEETH

Frequently, in infiltration anesthesia, a number of teeth may be anesthetized with but one buccal puncture, particularly when the bicuspids and molars of the Superior Maxilla are to be extracted. The needle (42 mm. long) is inserted at the level of the root apex of the canine tooth where the solution is gradually discharged in order to anesthetize this tooth. If the bicuspids and molars are to be anesthetized, the needle is then slowly advanced over the apices of these teeth and the solution slowly injected over each tooth. With the long 1⅝″ needle it is possible to reach the root apices of the first and sometimes the second molar. If it is also necessary to anesthetize the anterior teeth, the syringe is refilled and the needle inserted again into the same puncture over the canine tooth and the needle advanced toward the apices of the lateral and central incisor teeth, anesthetizing each tooth as the needle advances.

Palatally, a posterior or anterior palatine or both injections are given, depending upon the teeth to be extracted.

INFILTRATION ANESTHESIA IN THE LOWER ANTERIOR TEETH

In the mandible, by the infiltration method, it is possible to anesthetize the six anterior teeth in the following manner:

Insert the needle labially between the two lower central incisor teeth, at their apex level. Then proceed on to the right, injecting slowly until the incisive fossa is reached, where about 1 cc. of the solution is deposited. This fossa is located below the apices of the lateral incisor and canine tooth. The needle is drawn back to the median line and, without withdrawing it entirely from the tissues, it is directed to the incisive fossa on the opposite side, where another 1 cc. of the solution is deposited.

Lingually, about ¼ cc. is injected behind each central incisor and also between the canine and first bicuspid teeth. Satisfactory anesthesia will be obtained in this manner for the incisors and cuspid teeth.

CHAPTER VI

POST-OPERATIVE SEQUELAE

One of the most frequent causes of after pain is infection, which may be due to non-sterile solution, syringe or needle. A sterile needle may also be reinfected by coming in contact with the mucous membrane or fluids of the mouth. Care should be taken before and during the injection not to contaminate the needle in this manner.

Pain after extraction may be also caused by a septic condition already existing or else by the wound being infected during or subsequent to the extraction. The sockets of infected teeth should be thoroughly curetted after the extraction.

Deteriorated solutions, the unnecessary addition of strong antiseptics to the solution, traumatism during the operation, spiculae of bone left in the socket—all these may also be considered as other contributing causes for post-operative pains.

Another unpleasant sequelae after extraction is edema, manifesting itself by a more or less pronounced swelling.

This condition may be caused by non-isotonic solutions, exerting osmotic pressure in either direction between the tissue cells and the injected fluid and causing death of the cells, as explained in the chapter dealing with the preparation of the solution. Edema may also be caused by injecting into a muscle. Anesthetic solutions, as a rule, are absorbed very quickly by the connective or areolar tissues. The absorption, however, is very slow when a muscle is injected. In the mandibular injection, if the needle is inserted too low, beneath

the lingula, or too mesially, the Internal Pterygoid muscle may be infiltrated, causing edema and sometimes false ankylosis, lasting from a few hours to a day or two.

TREATMENT

Post-operative pains may be abated in the following manner: The socket is at first thoroughly washed out with warm saline solution. All spiculae of bone, if any, are removed and the socket is then packed with iodoform gauze saturated with Procaine powder. Or else the Procaine powder may be blown into the painful socket by means of the powder blower, after which it is gently packed with the gauze. The following mixture (Tribel's) will be found efficacious:

Chloral-hydrate	2.0
Camphor	1.0
Procaine	0.5

Internally, Phenacetin or Aspirin in five-grain doses may be administered, to be repeated again in three hours, if necessary.

TOXIC EFFECTS

With the introduction of Procaine in combination with Suprarenal Extract in local anesthesia the toxic effects have been reduced to a minimum. The author has been using this combination for more than ten years, injecting in thousands of cases, some of the patients suffering from serious cardiac and pulmonary lesions, and has yet failed to observe manifestations of any serious toxic symptoms.

The Suprarenal Extract, by its vaso-constriction, prevents the constitutional absorption of the injected anesthetic, thereby still further diminishing its toxicity.

Any anesthetic should be injected very slowly into the tissues. Experiments upon animals have proven that the toxicity is increased with the rapidity of the injection. This rule holds also true to Procaine.

There are cases, however, when toxic symptoms, although rare, do arise, and they are more often due to the psychic attitude of the patient toward the impending operation than to the actual toxicity of the drug. These symptoms may manifest themselves by simple pallor, palpitation, or slight trembling of the extremities, especially noticeable in anemic patients. These symptoms, as a rule, disappear quickly, by the administration of aromatic spirits of ammonia, or about seven or eight drops of camphorated validol in a little water. Strong black coffee is also very efficacious and the effect very lasting.

In more disquieting symptoms, such as fainting or syncope, the head should be lowered to increase its blood supply. This should be followed by the inhalation of ether or from one to three drops of emyl nitrate on a napkin.

All of these preparations should be kept always on hand, ready for immediate use, should necessity arise.

CHAPTER VII

PULP EXTIRPATION UNDER LOCAL ANESTHESIA

Pulps may be extirpated painlessly and more or less bloodlessly with an ordinary infiltration injection, using about 2 cc. of a 2% Procaine solution for each pulp to be anesthetized. Two Novol Procaine-Suprarenal Extract Tablets No. 1 (Dental) are dissolved in 2 cc. of Ringer Solution and then injected above the apex of the tooth from which the pulp is to be removed, 1½ cc. on the buccal or labial side and the remaining ½ cc. on the lingual side.

The technique for this injection is the same as described under the chapter on "Infiltration Anesthesia." Extreme precautions should be exercised in maintaining strict asepsis, as an infection may lead to very troublesome pericemental inflammation.

After the injection of the solution, about five or ten minutes should elapse before the attempt is made to extirpate the pulp. This interval of time may be utilized in adjusting the rubber dam to the tooth to be operated on and also in the sterilization and preparation of the necessary instruments.

The pulps of the incisors, cuspids, bicuspids and quite often the upper molar teeth may be efficaciously removed in this manner.

EXTIRPATION OF PULPS UNDER CONDUCTION ANESTHESIA

The extirpation of pulps under conduction anesthesia is not as a rule uniformly successful. The pulps of the incisor teeth, when anesthetized by the conductive method, may still be sensitive due to the anastomosis from the opposite side. In these cases pressure anesthesia should be used to completely anesthetize the pulp.

It has also been found in successful mandibular injections that the pulp of a molar, for instance, although painlessly exposed, may yet sometimes be sensitive to the penetration of the broach. The anesthesia here, too, may be completed very easily by the pressure method, using a Novol Procaine billet.

Many operators have great success in extirpating pulps under conductive anesthesia by using a 3% and even a 4% Procaine Solution, dissolving 3 or 4 Novol Procaine Tablets No. 1 (Dental) to each 2 cc. of Ringer Solution.

The anesthetization of the pulps of the lower molar teeth by the ordinary infiltrative method is seldom successful due to the density of the alveolar process.

Teeth with pulps partially calcified and also teeth with pulp stones will resist devitalization by arsenic or pressure method. Such teeth should only be devitalized by means of a local injection.

CAVITY PREPARATION

In cavity preparation conduction anesthesia may be used with almost uniform success. It will be found a real blessing in hypersensitive cavities. The technique of the injections is the same as outlined before, with the exception that the anterior and posterior palatine injections are not necessary in anesthetizing the upper incisors, cuspid and molar teeth, and also the long buccal (Buccinator muscle) anesthesia may be omitted in a mandibular injection.

Care should be taken, however, in excavating cavities of teeth which have been desensitized in this manner not to penetrate into the pulp chamber and thus injure the pulp tissue.

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Novoc

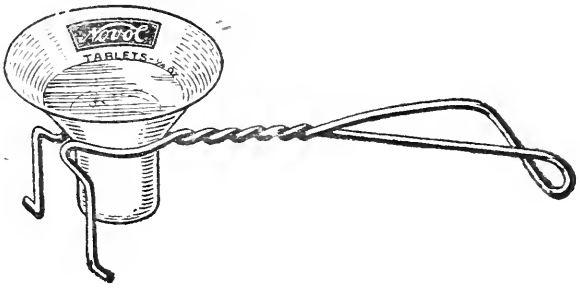
(REG. U. S. PAT. OFFICE)

PROCAINE TABLETS

UNDER THE PROVISIONS OF THE TRADING WITH THE ENEMY ACT

The U. S. Government has taken over the patent that gave monopoly for the manufacture of the local anesthetic, Novocain, to a German corporation, and has granted licenses to American concerns for the manufacture of this product, on condition, however, that this drug should be called by an American name—Procaine, and that it shall be made in every way as the article originally imported from Germany.

Samples of our Procaine have been submitted to the Federal Trade Commission, which has established its chemical identity and purity.



NOVOCOL CHEMICAL MFG. CO., Inc.
2923 ATLANTIC AVE. BROOKLYN, N.Y.

Novol

PROCAINE TABLETS

are offered in the following formulae, with and without a combination of Suprarenal Extract.

NOVOL PROCAINE - SUPRARENAL EXTRACT TABLETS "NO. 1" (DENTAL)

Procaine ⅓ grain (0.02 gram).
Suprarenal Extract 1/1500 grains (0.000045 gram).
1 tablet dissolved in 16 minims (1 cc.) of physiological salt or Ringer solution will give a 2% solution.
1 tablet dissolved in 32 minims (2 cc.) of physiological salt or Ringer solution will give a 1% solution.
Tubes of 20, 55c. Vials of 100, $2.50.
10 tubes, $5.00. 6 Vials, $13.50

NOVOL PROCAINE - SUPRARENAL EXTRACT TABLETS "NO. 2."

Procaine ⅓ grain (0.02 gram).
Suprarenal Extract 1/3300 grain (0.00002 gram).
1 tablet dissolved in 16 minims (1 cc.) of physiological salt or Ringer solution will give a 2% solution.
Tubes of 20, 55c. Vials of 100, $2.50.
10 tubes, $5.00. 6 Vials, $13.50

NOVOL PROCAINE - SUPRARENAL EXTRACT TABLETS "NO. 3."

Procaine 1.5 grain (0.1 gram).
Suprarenal Extract 1/300 grain (0.000225 gram).
1 tablet dissolved in 160 minims (10 cc.) of physiological salt or Ringer solution will give a 1% solution.
1 tablet dissolved in 80 minims (5 cc.) physiological salt or Ringer solution will give a 2% solution.
Tubes of 10, 70c. 10 tubes $6.30

HOW TO USE

Novol

(Reg. U. S. Patent Office)

Local Anesthetic with Suprarenal Extract Tablets

In Infiltration and Conduction Anesthesia

1. Fill Porcelain dissolver with ¼ oz. of Novol.

NOVOL Local Anesthetic is prepared under th most exacting antiseptic precautions and is ab solutely sterile when it leaves our laboratories.

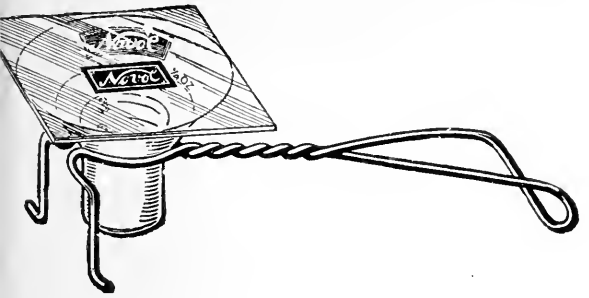
NOVOL has the most ideal combination.

(1) Procaine (drug introduced by the German as Novocain)—Seven times less toxic than Cocaine

(2) Suprarenal Extract—Localizes and intensifies the action of the anesthetic. By virtue of its vasc constriction it also acts at the same time as a cardia stimulant.

(3) Chloretone—A safe antiseptic, mild anes thetic and hypnotic.

(4) Ringer Solution—Sodium Chloride, Calciu Chloride and Potassium Chloride (all chemicall pure) to make a solution of the same density an saline strength as the cell contents and normal bloo serum.



4. Ready for injection.

PROTECT unused portion from dust and light with glass cover until the next extraction.

Enough for 3 or 4 extractions.

It takes but a minute to prepare a ¼ oz. of Novoc Local Anesthetic in this manner, enough perhaps for your days work.

But in this minute you have done everything in your power to protect not only the health and comfort of your patient, but your own reputation.

THERE are other methods of preparing Novol Local Anesthetic.

Some operators prepare only enough Novol fo each extraction by boiling about 2½ c c. of Novol i a Porcelain Dissolving dish and then adding ½ o 1/3 of a Suprarenal Extract Tablet.

Others boil 1 oz. of Novol and then add 4 Sup rarenal Extract Tablets.

And still others prefer to boil the entire conten of the bottle and then dissolve all the tablets at on time.

This would only be advisable, however, if a or 4 oz. bottle of Novol may be used up in con paratively short time.

Novol Local Anesthetic contains 1.5% of Pr caine, strong enough for any operation.

A stronger Procaine solution may be easily o tained, if necessary, by the addition of one or tv Novol Procaine Tablets No. 1 (Dental) to each oz. of Novol liquid after it has been boiled.

Novol

DEVITALIZING FIBRE

Is the "last word" in tooth devitalization. It will devitalize the tooth painlessly and rapidly in 95% of the cases used. And also due to its strong antiseptic properties will render the pulp chamber and root canal aseptic and strongly resistant to bacterial invasion during and after pulp removal.

It is incorporated in a fibrous, non-stringy vehicle, and is easily applicable.

In using Novol Devitalizing Fibre, observe the following precautions.

1. Do not apply on an inflamed pulp. Reduce the hyperaemia by a sedative application for 24 or 48 hours.
2. Remove all the debris and decayed dentine from the cavity before applying.
3. Do not exert pressure.
4. Do not apply too large doses.

Sold in Glass Stoppered Bottles. **Price $1.00 per Bottle.**

Novol

DESENSITIZING PASTE

A Specific for Hypersensitive Dentine

FORMULA

Novol Desensitizing Paste consists of the following ingredients:

1. Trioxymethylene $(CH_2\ O)_3$
2. Thymol $C_6\ H_3\ (CH_3)\ (C_3\ H)$
3. A combination of obtundents to make the application painless.

Price $2.00 per Jar

NOVOCOL CHEMICAL MFG. CO.

2923 Atlantic Avenue — Brooklyn, N. Y.

Novol

ACCESSORIES

PRICE LIST No. 3

NOVOL Perfecto Syringe (glass and metal) complete with all attachments and metal box, which may be used as a sterilizer.	$12.00
NOVOL Perfecto Syringe only with wrench and cap.	6.50
NOVOL Stove for sterilizing the Novol Perfecto Syringe	1.50
NOVOL All metal Syringe, washerless, ground in metal plunger	3.00
NOVOL Conducto Syringe, all glass (Luer type) 2cc	1.75
NOVOL Conducto Syringe, all glass (Luer type) 3cc	2.25
NOVOL Ringer flask, with ground in glass stopper and cap	2.00
NOVOL Porcelain dissolver 3cc with glass cover	.75
NOVOL " " 10cc. " "	1.00
NOVOL Platinum needles	
42mm. 23 gauge	3.00
25mm. 25 gauge	2.00

Novocol Chemical Mfg. Co., Inc.

2923 ATLANTIC AVE. **BROOKLYN, N. Y.**

Novol Local Anesthetic with Suprarenal Extract Tablets offers a great variety of uses

THE percentage of Suprarenal Extract may be increased or diminished as necessity dictates.

Should the operator desire a stronger anesthesia, a more bloodless operation, two instead of one Suprarenal Extract Tablets may be used to each ¼ oz. of Novol.

On the other hand, there are certain cases when less Suprarenal Extract is desirable, which can be easily done by using only ½ a Suprarenal Extract Tablet to each ¼ oz. of Novol.

The Suprarenal Extract Tablets are very effective in checking hemorrhage after extractions.

The procedure is simple. Wash out the bleeding socket with hot water. Place one Suprarenal Extract Tablet in the socket, and apply pressure.

"You Make a Mix"

of oxyphosphate of zinc cement for every operation, whether it is of a temporary nature or for the cementation of an inlay or a bridge.

Yet the after effects of an extraction may be much more serious than that of an improperly set bridge.

Truly, is it not worth while to take just one minute of your time and be certain that no infection or perhaps death will follow an extraction?

PRICES

2 oz. bottle	$ 1.10
4 oz. bottle	2.00
24 oz. (6-4 oz.) . . .	11.50
48 oz. (12-4 oz.) . . .	22.50
3 c c. Novol Porcelain Dissolver (to boil ¼ oz. Novol) . . .	75c.
10 c.c. Novol Porcelain Dissolver (to boil ½ oz. Novol) . . .	$1.00

FOR SALE BY

NOVOCOL CHEMICAL MFG. CO., Inc.
2923 Atlantic Ave.
Brooklyn, N. Y.

NOVOL PROCAINE TABLETS "NO. 4."

Procaine ¾ grain (0.05 gram).

1 tablet dissolved in 40 minims (2.5 cc.) of physiological salt or Ringer solution will give a 2% solution.

Tubes of 20, 55c.

10 tubes $5.00

NOVOL PRESSURE-STHESIA BILLETS

For Pressure Anesthesia.

Procaine 0.01 gram.

Suprarenal Extract 0.00015 gram.

Tubes of 20, 50c. Vials of 100, $2.25.

10 tubes, $4.50 6 Vials, $12.50.

RINGER TABLETS.

Each tablet contains

Sodium Chloride	0.05 gram.
Potassium Chloride	0.002 gram.
Calcium Chloride	0.004 gram.

Tubes of 20, 10c. Vials of 100, 40c.

To make a Ringer solution dissolve three tablets to an ounce of distilled water.

PROCAINE POWDER

5 gram vials, $2.00 per vial.

1 oz. containers, $8.50 per oz.

NOVOL PORCELAIN DISSOLVER

3 cc., 75c.

10 cc., $1.00

NOVOCOL CHEMICAL MFG. CO.

2923 Atlantic Ave. Brooklyn, N.Y.

DIRECTIONS

The technic of the use of Novol Procaine Tablets is very simple.

A stock of physiological salt or Ringer solution is kept on hand. These are easily prepared by dissolving 3 grains of salt or 3 Ringer Tablets to an ounce of boiled distilled water. About 2½ cc. of this physiological salt or Ringer solution is placed in a Novol Porcelain dissolving dish and the contents boiled over an alcohol flame. Two Novol Procaine Suprarenal Extract Tablets are added and the solution again brought to the boiling point for but a few seconds and the solution is then ready for injection.

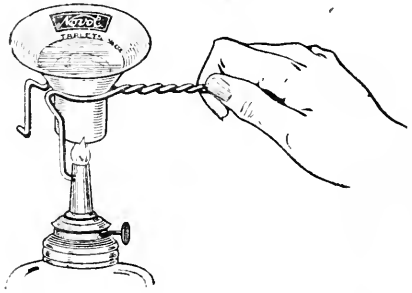
Caution:—Do not prolong the boiling after the Novol Procaine Suprarenal Extract Tablets have been added. This does not, however, apply to the Novol Procaine Tablets No. 4, which may be boiled without fear of decomposition, as they do not contain Suprarenal Extract.

The Ringer solution must be neutral in reaction as the slightest alkalinity will turn the Suprarenal Extract at first a pinkish and then brownish color, when the Novol Procaine Suprarenal Extract Tablets are dissolved in the porcelain dish.

To obviate this difficulty the following simple expedient may be adopted:

Dissolve 10 drops of dilute hydrochloric acid in one ounce of distilled water. This should always be kept on hand. When making up a Ringer solution, add one drop of this 2% H C L to each ounce of the Ringer solution.

Strict asepsis must be maintained before, during and after the operation, such as sterilizing the needle and syringe, etc. The field of operation should be painted with equal parts of aconite and iodine.



FOR

CONDUCTION INFILTRATION AND PRESSURE ANESTHESIA

COLUMBIA UNIVERSITY

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